**Remarks:**

**Claim rejections-35 USC §102**

Claims 1-6 stand rejected under 35 USC §102(b) as being anticipated by U.S. Patent 5,659,478 (Pennisi et al). This rejection is respectfully traversed.

Claims 1-6 have been amended to distinguish over the reference cited by the Examiner.

The present invention involves methods for manufacturing a work piece and then, in a separate set of operations, finishing that piece to remove imperfections such as burrs and the like. A second embodiment of the present invention involves taking an existing work piece and performing finishing operations upon it.

Applicant, Joseph Arvin, and his attorney wish to express their appreciation for the courtesy extended by Examiner Cabrera at the interview conducted on May 31, 2006 at the Patent Office.

At the interview, Applicant stated that he is unaware of any computer-controlled machining system that will perform highly-toleranced finishing operations on an existing work piece by modifying the machine instructions used to manufacture the work piece to operate a robotically controlled finishing tool. Submitted herewith is the Declaration of Joseph L. Arvin establishing his experience in the gear-manufacturing industry and confirming the opinion he expressed at the interview.

In fact, the prior art cited by applicant to the Patent Office confirms Mr. Arvin's observations.

U.S. Patent 5,091,861 (Geller et al) teaches and describes a system for automatic finishing of machine parts which uses a computer-generated solid model of the work piece and claims to use this data to successfully operate a computer-controlled deburring machine. The applicant states, "Automatic, computerized systems for deburring are not known to the inventors." A careful reading of the Geller reference demonstrates that the only deburring operation identified is that of deburring a straight edge on a part for which a specifically designed clamp must be used. There is no description in Geller et al of deburring or otherwise machining complex curved edges or surfaces on work pieces. See, for example, Figs. 4a, 4b and 4c illustrating the part and the only surface to be deburred (80 in Fig. 4a) the tower of individual clamps (Fig. 4b) and a cross-section of an individual clamp showing how the part is held during deburring process.

U.S. Patent 6,079,090 (Ungaro) teaches and describes a numeric controlled machine tool for turning and hobbing mechanical parts. Although this reference states at col. 4, line 26: "Moreover, the carriages 4 and 6 can machine simultaneously by using the hobbing tool together with another tool of the carriage 4, for example to deburr by skimming the part at the region where the hobbing tool reduces its pressure. The machine tool is also capable of chamfering the gear during gear hobbing."

Nowhere in this reference does the inventor describe how this process is carried out or how the chamfering or deburring tools are controlled.

U.S. Patent 5,785,771 (Mitchell Jr. et al) teaches and describes a method for manufacturing precision gears described in detail the benefits of precise manufacture of such gears and the benefits of chamfering such gears to reduce stress. Mitchell Jr. describe a masking process used to allow selective portions of the manufactured gear to be hardened. In Fig. 1c, the inventors illustrate the chamfering of a gear surface but do not describe any automated method for doing this.

U.S. Patents 6,074,481 (Bittner et al) and 6,080,349 (Bittner et al) also teach and describe masking tools used to allow the selective hardening of the gear surface.

U.S. Patent 5,810,522 (Parker) entitled "Hand Held Bar Edging Tool and Support Therefor," U.S. Patent 4,334,810 (Behnke et al) entitled "Gear Deburring Apparatus and Method," and U.S. Patent 4,412,765 (Occhialini) entitled "Apparatus for Facilitating Chamfering/Deburring Tool and Gear Meshing" are all representative of apparatus used to position a gear so that the hand operation of deburring, chamfering or other machining actions can be taken.

U.S. Patent 5,154,533 (Baumstark) teaches and describes an apparatus for chamfering and deburring the end edges of a tool production gear which is also hand process rather than a computer controlled process.

Use of computer-controlled machine tools to deburr complex gears is described in an article submitted to the Patent Office by the applicant entitled, "Robotic Automated Deburring of Aerospace Gears" which appeared in the January/February 2001 issue of *Gear Technology Magazine*, and was written by Michael Nanlawala. In this article, the author describes with great particularity the importance of having precisely chamfered and deburred gears when used in aerospace and aeronautical applications and also describes efforts made by others to automate this process by using computer-controlled machine tools. To applicant's knowledge, none of these processes have been a commercial success.

The process as described in the article used the "teach pendant" method of identifying to the computer a path along which a finishing tool must travel. This is a tedious, time consuming and somewhat inaccurate process whereby the machine tool must be manually positioned on a portion of the contour to be machined, and the point recorded in the computer's memory. Where a work piece has a number of curved surfaces, or has gear teeth with opposed edges that must be finished, a great number of these points must be identified. It is also not certain that a series of points identified on one work piece will work for other work pieces even though all were made by the same machine-controlled process.

The desirability to use the computer to "model" the gear surfaces and use this modeling to control the finishing tool is described in an article entitled "New Gear Software" appearing in the January/February 2000 issue of *Gear Technology Magazine*. This reference has also been submitted to the office for consideration. The author describing the process states that he does not recommend using his product for creating the geometry needed to manufacture a spiral bevel gear by traditional metal cutting methods.

If the software cannot be used to cut the gear in the first place, it certainly cannot be used to later identify the surfaces on the gear with particularity to either deburr, chamfer or otherwise machine or finish them.

The foregoing review of the art clearly demonstrates that the invention described by applicant is neither taught nor suggested by these references taken together or individually. No reference teaches or suggests applicant's approach to solving the problem of using the computer-controlled robotic machining arm to successfully track and finish anything other than a linear surface without requiring the use of specially designed jig holders or other expedients.

Applicant has amended Claims 1 through 6 to reflect the foregoing arguments. In particular, Claims 1 and 6 have been amended to make clear that the machining operations referred to are finishing operations, carried out after the original workpiece has been manufactured. In addition, these claims have been amended to make more certain that the finishing operations are carried out on selected portions of the workpiece periphery. This language finds support in the specification, *inter alia*, at paragraphs [0037] and [0040].

Use of the invention on non-gear workpieces such as gear casings, jet engine blades and vanes is set forth at paragraphs [0040] and [0075].

For the foregoing reasons, the claims as amended should be allowed, and the application should be passed to issuance.

Applicant respectfully contends that the application, with claims 1-6 as amended, and

with claim 19 cancelled, is now in condition for allowance. Should the Examiner have any

further questions, please telephone the undersigned directly.

Respectfully submitted,

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